Section VIII. Protection and Restoration Recommendations and Guidelines

Introduction

Setting protection and restoration goals can be a difficult task, especially for an area that incorporates a 430 square mile (1,114 square kilometer) lake and 1,176 square miles (3,046 square kilometers) of land. Not only is it a large geographic area, but it spans two countries, one sovereign First Nation, incorporates hundreds of political jurisdictions and numerous conservation organizations and agencies. Obviously, it would be impossible to develop an individual plan for each organization and jurisdiction within the purview of this project. As an alternative, this section presents a set of conservation and restoration guidelines and recommendations from the perspective of the entire project area that can be used by local municipalities, land trusts and other agencies and organizations to engage in more integrated conservation and restoration planning, in which individual projects are seen as part of a system-wide network of conservation and restoration areas. Using this integrated and holistic approach, individual projects can be undertaken to meet local needs and priorities in the context of maximizing benefits to the larger ecosystem.

HIGHLIGHT

Within the Lake St. Clair coastal zone, there are very few natural communities or ecological systems that that are considered self-sustaining.

There are clear benefits from having a significant proportion of a region's lands in natural cover (see sidebar), but only a small percentage of the lands surrounding Lake St. Clair remain in such a state. Integrated conservation and restoration planning for the region necessitates a three-pronged approach: protection of existing high quality natural areas; enhancement of degraded natural lands; and restoration of sufficient additional lands to create a matrix of interconnected self-sustaining natural communities with intact ecological functioning. Within the Lake St. Clair coastal zone, there are very few natural communities or ecological systems that that are considered self-sustaining, with a full complement of associated plants and animals. Providing protection to those sites or portions of those sites should be of the highest priority. But what should be done with the remaining small, scattered fragments of natural vegetation? How do we improve the current condition of those sites that still have some ecological integrity and provide habitat for rare plants and animals? Finally, how do we strategically target additional land for restoration? How much land? Where? Which natural communities?

Today only 0.5 percent of the land in the Michigan portion of the project area could be considered high quality natural area in fair condition. Although specific values for the Ontario portion are unavailable they are probably similar. As noted in Tables VIII B - 1 and VIII B - 2 later in this section, the natural communities that have experienced the greatest losses in area are

CASE STUDY

The Value of Nature

Why should we be so concerned about the loss of natural lands? Natural lands provide ecosystem goods and services that are essential to humans. Ecosystem services include things like air and water purification, reduction of toxic substances, detoxification of various substances, i.e., via bacteria, etc., nutrient storage and cycling, climate regulation, soil development, flood control, pest outbreak control and pollination[1,2]. Ecosystem goods include things like timber, gravel, food, oil, gum, fiber, dye and other products we use to nourish, clean, clothe, shelter and refresh ourselves. Plants are also important providers of genetic resources for pharmaceuticals and agricultural products. Because someone did not establish a company or hire people to produce these goods and services, they are often undervalued or unvalued. Unlike goods and services produced by people, we do not have well established mechanisms to quantify the value of goods and services produced by nature. Four major industries in Michigan - natural resource-based tourism, forestry, mining and agriculture - are dependent on the land. Together, they account for approximately $63.2 billion or 29 percent of Michigan's economic[3] output, but this figure only reflects the cost of converting an existing resource – crystalline lakes, immense forests, minerals, ore and fertile soils – to marketable commodities, rather than the value of the resource itself. (cont.)

(cont.) How many acres/hectares of natural lands do we need to conserve to ensure that the ecosystem continues to produce the goods and services that matter? The answer depends on what goods and services are needed and in what quantities. Like any other good or service, we must make sure that the "balance" in our natural resources "account" is sufficient to sustain the ecosystem goods and services we need and enjoy. This, in turn, requires that we quantify the value of these goods and services. It is difficult, but attempts are now being made to quantify the value of nature's services. In *Making Smart Growth Work*, Porter suggests that open space can be valued by its market value, contingent value (willingness to pay), production value, enhancement value (value added to adjacent properties), fiscal benefits (cost/benefit analysis), natural system value and intangible value[4]. Other ecosystem service valuation methodologies have been explored and are discussed in a series of articles published in the May 2001 issue of the Stanford Environmental Law Journal.[5]

lakeplain prairie (98.2 percent loss) and lakeplain oak openings (92.7 percent loss). There has also been a large decrease in all forest types including mesic southern forest, dry-mesic southern forest, southern floodplain forest and southern swamp. Although there was only a 30 percent loss of Great Lakes marsh overall, most of the marsh has been diked or hydrologically disconnected from Lake St. Clair. A total of 102 rare species occur in the Michigan portion of the project area and 68 with the Ontario portion. The vast majority of these species are associated with lakeplain prairie, lakeplain oak opening, Great Lakes marsh and open water. The average size of natural patches - areas on the landscape differing in appearance from their surroundings - was 2.42 acres in 2002 (nearly 1 hectare), which represents a very high degree of fragmentation; much of what remains has been degraded by overexploitation, invasive species and the disruption of natural processes such as fluctuating water levels and fire. These stressors are discussed in detail in Section V of this document.

VIII. A. Guidelines for Conservation and Restoration

Setting Goals and Objectives

An integrated planning approach requires that individual projects be planned and undertaken in the larger context of the Lake, its coastal area and ultimately the watershed. Management of Lake St. Clair and its watershed has been addressed, partially or wholly, by several plans, each with goals and objectives for the project area or large portions of it. They include:

- Lake Erie Lake Area Management Plan (LaMP) (2004) - *www.epa.gov/glnpo/lakeerie/2004update*
- St. Clair River Habitat Management Plan - *www.friendsofstclair.ca/pdf/hab_mgmt_plan.pdf*
- A Natural Heritage System for the St. Clair River Watershed - *www.friendsofstclair.ca/pdf/nhs.pdf*
- Lake St. Clair Management Plan (U.S. Army Corps, in progress) - *www.glc.org/stclair/manageplan*
- St. Clair River Area of Concern (1998)
  U. S. EPA - *www.epa.gov/glnpo/aoc/st-clair.html#pubs*
  Environment Canada - *www.on.ec.gc.ca/water/raps/stclair/intro_e.html*
- Clinton River Area of Concern - *www.epa.gov/glnpo/aoc/clintriv.html*
- Detroit River Area of Concern
  Environment Canada - *www.on.ec.gc.ca/water/raps/detroit/intro_e.html*
  U. S. EPA - *www.epa.gov/glnpo/aoc/detroit.html*

HIGHLIGHT

The existing plans that address Lake St. Clair natural resource management provide very little guidance in the way of specific goals or objectives to help communities make difficult land use decisions.

In addition, the recently-published *Explore Our Natural World: A Biodiversity Atlas of the Lake Huron to Lake Erie Corridor*[6] (*www.epa.gov/ecopage/stclairbiodiv*) provides complementary background on the natural communities in the region and a variety of related issues.

These resources should be considered in the development of general goals and objectives for Lake St. Clair coastal habitat. However, despite the tremendous

amount of information contained in these and other plans, they provide very little guidance in terms of specific objectives to help communities and organizations make difficult land use decisions. For example, typical goals for loss of fish and wildlife habitat are, "no further loss of productive fish and wildlife habitat, net gain of restored and protected habitat in accordance with fish and wildlife management plans and local measures in place to protect conserved and restored sites in perpetuity." A goal from the St. Clair River Area of Concern's (AOC) Remedial Action Plan to address no further loss of productive fish and wildlife habitat is to "ensure that sufficient enforceable mechanisms are in place to protect existing aquatic and wetland habitat from cultural destruction and degradation." Other AOC's have developed goals that incorporate 1) self sustaining communities, 2) acceptable normal levels of deformities and reproductive problems, 3) diverse macroinvertebrate communities and 4) diverse animal and fish communities.

Although still broad and non-specific, the Lake Erie LaMP provides useful guidance in its vision and habitat goals. Key provisions of the Lake Erie LaMP Vision include:

- Natural resources are protected from known, preventable threats
- Native biodiversity and the health and function of natural communities are protected and restored to the greatest extent feasible
- Natural resources are managed to ensure that the integrity of existing communities is maintained or improved
- Land and water are managed such that water flow regimes and the associated amount of materials transported mimic natural cycles

Similarly, the Lake Erie LaMP Habitat Goals include:

- Protect and maintain high quality habitats and ecosystem processes that sustain them.
- Restore, rehabilitate, enhance and reclaim degraded habitats and impaired hydrological function.

These statements set a general direction, but do little for determining what to protect and restore, how much to protect and restore and where these activities should take place on the landscape. A conceptual framework for conservation and restoration planning is needed to apply these broad goals in developing a series of specific recommendations. Both are presented below.

HIGHLIGHT

Biodiversity is the variety of living organisms, the genetic differences among them, the communities and ecosystems in which they occur and the ecological and evolutionary processes that keep them functioning.

What exactly are we trying to conserve? Most conservation references today focus on the conservation of an area's biological diversity or biodiversity. Biodiversity is most simply defined as the variety of life on earth and its processes. More specifically, it is the variety of living organisms, the genetic differences among them, the communities and ecosystems in which they occur and the ecological and evolutionary processes that keep them functioning, yet ever changing and adapting[7]. While organisms and communities are disappearing too rapidly to adapt, the first impulse is often simply to preserve them. At the same time, it is critical to remember that isolated organisms or remnants of natural communities are not necessarily viable in the long run; they may lack genetic variability to respond to natural environmental changes, specific co-adapted organisms such as pollinators or critical natural processes – multiple factors that contribute to biodiversity.

FACT

Biodiversity is typically measured at several levels of organization: genes, species, communities, ecosystems and landscapes.

Biodiversity is typically measured at several levels of organization: genes, species, communities, ecosystems and landscapes. The principles of biological protection and restoration are based on several assumptions: 1) biodiversity depends on functioning ecosystems, 2)

biodiversity, at all levels, is integral to ecosystem function, 3) priority should be given to keystone species and 4) ecological redundancy is important to the long-term persistence of ecosystems. In addition, it is important to realize that native ecosystems are complex systems that we still do not fully understand and 5) certain natural processes and disturbances are critical to the health and evolutionary pathways of native ecosystems and their associated biota[8].

HIGHLIGHT

The Nature Conservancy defines ecological integrity as the ability of an ecological system to support and maintain a community of organisms that has species composition, diversity and functional organization comparable to those of natural habitats within a region.

According to Daily[9], protected and restored ecosystems should be self-sustaining and biodiversity should be restored and maintained at as high a level as possible. In addition, Daily recommends that the community types that should most frequently be targeted for restoration are those that are comprised of area limited species and critical habitat that is poorly represented in the surrounding natural landscape.

The Nature Conservancy (TNC) recommends that conservation efforts focus on species, ecological communities and ecological systems, with a special emphasis on ecosystem integrity and species viability. TNC defines ecological integrity as the ability of an ecological system to support and maintain a community of organisms that has species composition, diversity and functional organization comparable to those of natural habitats within a region (reference sites). An ecological system or species has integrity or is viable when its dominant ecological characteristics - composition, structure, function and processes - occur within their natural ranges of variation and can withstand and recover from most disturbances[10]. In other words, ecosystems and populations of plants and animals should be self-sustaining.

To truly conserve biodiversity, TNC recommends that there be a sufficient number, distribution and quality of each native species and ecosystem to ensure their long term persistence within an ecoregion[11]. Capturing multiple examples is necessary to capture variability and to ensure persistence in the face of natural and human disturbances. However, it is an impossible task to track all native species of biota. The native biota of an area includes innumerable species unknown or at best poorly known to science embedded in numerous ecological systems whose webs of biotic and abiotic interactions are only poorly understood[12].

VIII. B. Setting Conservation and Restoration Targets: The Coarse Filter - Fine Filter Approach

One solution to this problem is to identify conservation targets. TNC defines conservation targets as a limited number of species, natural communities, or ecological systems chosen to represent the biodiversity of a given area. Due to the limitations of using individual species as filters for other species, it is recommended to initially select ecological communities or systems as coarse filter targets[13, 14]. If ecological communities are to work as coarse filters for all associated plants and animals they must:

1) be conserved as often as possible at a size and scale at which they naturally occurred prior to major human impacts
2) be conserved as part of dynamic, intact, landscape mosaics
3) maintain some level of connectivity between communities and
4) contain a full complement of their associated flora and fauna in so far as it is known[15].

HIGHLIGHT

Conservation targets are useful when a definitive knowledge of the number, distribution and quality of each native species and ecosystem is not available, which is usually the case.

In addition, TNC also recommends that smaller and rarer natural community types (lakeplain prairie, prairie fen, coastal plain marsh and bog) should be represented at a higher number in the landscape than larger and more common community types such as mesic southern forest.

This coarse filter approach should then be followed by the selection of species with unique ecological requirements that cannot be met through the conservation of natural communities or ecological systems. Wide ranging, rare, extremely localized or keystone species are all likely to need such fine filter strategies. One approach is to identify a set of species typical of or restricted to a particular community in the ecoregion and then use available information on their space, resource and breeding habitat needs to determine minimum area requirements for the community type[16]. Building on this concept, Lambeck recommends the use of a suite of focal species to define different spatial and compositional attributes that must be present in a landscape and their appropriate management regimes. All species considered at risk are grouped according to the processes that threaten their persistence. Within each group, the species most sensitive to the threat is used to define the minimum acceptable level at which that threat can occur. Species are categorized as either area-limited, resource-limited, dispersal-limited and/or process-limited[17]. Combined, this has commonly been referred to as the coarse filter-fine filter approach to biological conservation.

CASE STUDY

What exactly do we mean by restoration?

Restoration can refer to many different things. According to the Webster Dictionary, restoration is defined as "bringing something back to a former position or condition." In regards to Areas of Concern (AOCs) or Remedial Action Plans (RAPs), restoration typically refers to the improvement of beneficial use impairments. Common examples of beneficial use impairments are 1) restrictions on fish and wildlife consumption, 2) degradation of fish and wildlife populations, 3) bird or animal deformities or reproductive problems, 4) beach closings, 5) degradation of aesthetics, or 6) restrictions on drinking water consumption. Although restoration (when used in the context of a geographical area such as Lake St. Clair) typically refers to the movement of a degraded native ecosystem or community towards a higher state of ecological health or integrity, it is important to realize that restoration is really defined by the goals of the project. Different types of goals can be divided into several themes – active recreation, wildlife related recreation, biological diversity, ecosystem health and human health.

According to the Society for Ecological Restoration (SER), ecological restoration is an intentional activity that initiates or accelerates the recovery of an ecosystem with respect to its health, integrity and sustainability. Frequently, the ecosystem that requires restoration has been degraded, damaged, transformed, or entirely destroyed as the direct or indirect result of human activities[18]. Restoration attempts to return an ecosystem to its historic "developmental trajectory". This implies that there is not some sort of climatic state in which an ecosystem remains in a static equilibrium. Rather, ecosystems are dynamic assemblages of plants and animals that are in a constant state of flux as a result of environmental change (i.e., climatic), competition, stress, natural selection and natural disturbances.

Restoration methods can vary widely among projects depending on the extent and duration of past disturbances, cultural conditions that have shaped the landscape and contemporary constraints and opportunities[19]. Restoration may involve removing a dam or dike, filling in a ditch, breaking drain tile, reintroducing native species, removing invasive species, setting back succession and/or reintroducing natural processes like fire and flooding. (cont.)

How Much Habitat is Enough?

In a highly altered, fragmented, human dominated landscape such as the Lake St. Clair coastal zone, simply protecting the best remaining examples of natural communities and populations of plants and animals will not ensure their long-term persistence. Over the years, scientists have realized that H ecosystems and populations of plants and animals cannot persist in small isolated patches surrounded by incompatible land uses. If the goal is a healthy, functional Lake St. Clair and coastal zone, conservation strategies will have to go beyond protecting the best remaining occurrences. Large scale restoration is critical in protecting the long-term viability of the remaining high quality sites and populations of rare species, as well as enhancing water quality, but careful planning is required to determine which natural communities should be restored, in what quantities and where these lands should be located.

(cont.) How do we know we have successfully restored an ecosystem? NOAA states that the goal for the restoration of any natural ecosystem is to recover autogenic (self-renewing) processes to the point where assistance from restoration practitioners is no longer needed[20]. SER International asserts that the goal of every ecological restoration project is to reestablish a functional ecosystem of a designated type that contains sufficient biodiversity to continue its maturation by natural processes and to evolve over longer time spans in response to changing environmental conditions[21].

Below are attributes of what the Society for Ecological Restoration considers a restored ecosystem[22]:

1. It contains a characteristic assemblage of the species that occur in the reference ecosystem and that provide appropriate community structure.
2. It consists of indigenous species to the greatest practicable extent.
3. All functional groups necessary for the continued development and/or stability of the restored ecosystem are represented.
4. Its physical environment is capable of sustaining reproducing populations of the species necessary for its continued stability or development along the desired trajectory.
5. It functions normally for its ecological stage of development and signs of dysfunction are absent.
6. It is suitably integrated into a larger ecological matrix or landscape, with which it interacts through abiotic and biotic flows and exchanges.
7. Potential threats to its health and integrity from the surrounding landscape have been eliminated or reduced as much as possible.
8. It is sufficiently resilient to endure the normal periodic stress events in the local environment that serve to maintain the integrity of the ecosystem.
9. It is self-sustaining to the same degree as its reference ecosystem and has the potential to persist indefinitely under existing environmental conditions.

Two recent publications have attempted to consolidate scientific information from an array of sources into a set of generic conservation guidelines. *Conservation Thresholds for Planners* (*www.elistore.org/reports_detail.asp?ID=10839*), developed by the Environmental Law Institute (ELI) and published in 2003, focuses on providing recommendations to land use planners on patch size, edge effects, riparian buffers and connectivity. *How Much Habitat is Enough? A framework for guiding habitat rehabilitation in Great Lakes Areas of Concern* (*www.on.ec.gc.ca/wildlife/docs/habitatframework-e.html*), produced by Environment Canada (EC) and published in 2004, was developed for Remedial Action Plan teams and Public Advisory Committees who are working to rehabilitate ecosystems in 17 Canadian Areas of Concern across the Great Lakes basin. The purpose of this latter publication is to 1) assist in the selection of fish and wildlife habitat targets as part of delisting criteria and 2) prioritize sites for rehabilitation projects. The guidelines provided are not landscape or watershed specific and they are categorized into guidelines for wetland, riparian and forest habitats. As such they have important potential application to the Lake St. Clair project area. The following are examples of specific targets for habitat conservation and restoration offered by these existing publications.

- 20-60% of natural land coverage within a watershed – maintain biodiversity (ELI)
- Maximum of 10% imperviousness in a watershed – maintain water quality (EC)
- 75% of stream length should be naturally vegetated with a minimum 30 m buffer along both sides of stream – maintain and enhance water quality (EC)
- Establish 100 m wide riparian buffers – maintain and enhance both water quality and wildlife habitat (ELI)
- Minimum size block of habitat patch = 137.5 acres (55.65 hectares)– habitat for edge sensitive species (ELI)
- Greater than 10% of each watershed should be in wetland habitat – enhance water quality and flow regime (EC)
- Greater than 30% of watershed should be in forest cover – provide wildlife habitat and decrease water runoff (EC)
- Corridors should be a minimum of 50m to 100m in width - designed for species movement (EC)
- Establish buffers up to 230 to 300 m around edges of habitat – minimize edge influences such as predation, invasion of exotic species and nest parasitism (ELI)

Considerations for Setting Project Specific Targets

Using the preceding approach and general guidelines as a conceptual framework, the next step is to set project-specific goals and targets. Below are some key questions that should be asked in the context of the integrated approach offered above:

- What are you trying to conserve/restore?
  - Aquatic species habitat
  - Species diversity
  - Focal species
  - Rare species
  - Natural communities
  - Functional landscapes
  - Water Quality
- Why do you want to conserve/restore it?
  - Uniqueness/rarity
  - Important functions/services
  - Economic importance
  - Vulnerability
- How much do you need to conserve/restore?
  - Historic patch size and total acreage/hectares
  - Key ecological processes
  - Long term population viability of key species
- Where are you going to conserve/restore it?
  - Where there is an obvious or unique opportunity (e.g., existing open parcel)
  - Threats—parcel(s) threatened by development or other stressors
  - Large blocks
  - Connecting patches—again, examine what is being done elsewhere or nearby to maximize value added of multiple projects
  - Historic locations

HIGHLIGHT

It is important to realize that restoration is really defined by the goals of the project and the restoration site.

Although restoration typically refers to the movement of a degraded native ecosystem or community towards a higher state of ecological health or integrity, it is important to realize that restoration is really defined by the goals of the project and the restoration site. Restoration methods can vary widely among projects depending on the extent and duration of past disturbances, cultural conditions that have shaped the landscape and contemporary constraints and opportunities.

Related Questions by Category

Answering the general project questions above may require obtaining detailed scientific and other information about the area under consideration. The following questions should be considered in getting this more detailed information.

Biodiversity

- What was the historical distribution and quantity of each community type?
- What is the present distribution and quantity of each community type?
- How unique is the specified community type?
- What rare species does the community type support?
- What functions have been lost?
- What aspects should be restored?
- Does the community exist in relatively natural patterns, sizes and shapes?

- Does the community contain a complete set of native species typically associated with a healthy example of that type of community?
- Are there species that play a critical role in the long term viability of the natural community?
- Are there opportunities for restoring the specific community type? If so, where?
- Are there native species whose future viability will not necessarily be met through the conservation of natural communities?

Landscape Integrity

- What degree of fragmentation is present on the landscape?
- How much of the project area is covered by natural vegetation?
- What is the average size of natural vegetation patches?
- What is the level of connectivity between patches?

Aquatic Integrity

- How important is water quality and quantity to the function and health of natural communities and aquatic organisms in the watershed?
- What is the level of water quality in the watershed?
- How much of the riparian zone is vegetated?
- How much of the study area is urbanized and how is it distributed?

Stressors

- What are the stressors to each of the conservation targets?
- What are the biggest stressors to the conservation targets?
- Are there significant stressors that are more imminent than others?
- Are there ways to minimize the impacts of these stressors?

HIGHLIGHT

This Habitat Assessment, the Integrated Coastal Management Tool and the supporting natural community and species abstracts can provide answers to many of the questions for determining conservation and restoration targets for specific areas within the overall project area.

For the Lake St. Clair coastal area, this Habitat Assessment, the Integrated Coastal Management Tool described in Section VII and the supporting natural community and species abstracts (*www.glc.org/habitat/abstracts.html*) can provide answers to many of the questions for determining conservation and restoration targets for specific areas within the overall project area. The following tables provide an overview of presettlement distributions and quantities of the natural communities within the project area. This historic information can help in establishing restoration targets. In Michigan, for example, only 1.8 percent of the presettlement extent of lakeplain prairie, a globally rare natural community, remains. This table would be helpful, for example, in setting targets under Recommendation 2, Goal 3 in this section, which calls for "increasing the acreage of globally rare natural communities to at least 20 % of original (i.e., historic) coverage (or equivalent hectares)."

Summary of Lake St. Clair Coastal Project Area Natural Community Change

Table VIII B - 1 MI. Circa 1800 vs 2000 vegetation cover

Communities	Acreage circa 1800	% coverage	Acreage in 2000	% coverage	Loss in acres	% remaining	%change
Deciduous forest	199,537	62.9	40,304	12.7	159,233	20.2	-79.8
Hardwood swamp	68,693	21.7	13,302	4.2	55,391	19.4	-80.6
Lakeplain oak openings	5,196	1.6	327	0.1	4,869	6.3	-93.7
Lakeplain prairie	22,686	7.2	419	0.1	22,267	1.8	-98.2
Emergent wetland/aquatic bed/shrub swamp	19,450	6.1	13,601	4.3	5,849	69.9	-30.1
Other	1,539	0.5			1,539	0.0	-100.0
Total	317,101	100.0	67,953	21.4	49,148	21.4	-78.6

Table VIII B - 2 Ontario. Circa 1800 vs 2000 vegetation cover in acres

Communities	Acreage circa 1800	% coverage	Acreage in 2000	% coverage	Loss in acres	% remaining	% change
Deciduous forest	266,626	61.8	15,925	4	(250,701)	6.0	-94.0
Hardwood swamp	90,601	21	3,408	1	(87,193)	3.8	-96.2
Lakeplain oak openings	6,903	1.6	889*	.2	(6,903)	12.8	-87.2
Lakeplain prairie	31,063	7.2	1,160*	.3	(29,903)	3.7	-96.3
Emergent wetland/aquatic bed/shrub swamp	34,234	7.9	24,109	6	(10,125)	70.4	-29.6
Other	2,157	0.5	365	0	(1,792)	16.9	-83.1
Total	431,433	100	43,807	10	(387,777)	10.2	-89.8

*Data from Walpole Island only.

Preamble to Recommendations

Biodiversity is a critical component of ecological health and integrity. Although difficult to explain in concrete terms, it can best be conserved through adequate representation and landscape integrity. Representation can best be addressed through the coarse filter fine filter approach described in the guidelines discussed earlier in this section and aims to achieve species or community viability. Landscape integrity is critical to maintaining the long-term viability of species and natural communities. Landscape integrity addresses the health of the larger ecosystem, as well as large scale stresses impacting individual components across the landscape. Without landscape integrity, maintaining fragmented patches of habitat and isolated populations of flora and fauna becomes akin to keeping a patient alive on a respirator in the hopes that we can figure out a cure in the future. Both representation (to ensure viability) and landscape integrity are needed to maintain long term biodiversity within a region. The following recommendations are aimed at conserving and restoring representation and landscape integrity.

HIGHLIGHT

Both representation and landscape integrity are needed to maintain long term biodiversity within a region.

Restoration goals should be based on the portion of the overall goals of the project that can not be met through the conservation of existing lands. First priority should be placed on underrepresented communities, particularly G1 and G2 natural community types (see top box on pg. 214). Special emphasis should be placed on restoring connectivity

Species and Community Risk Rankings

The Natural Heritage Network, of which Michigan Natural Features Inventory and the Ontario Natural Heritage Information Centre are both members, uses a standardized ranking system to classify and target the species and ecosystems that are most at risk for inventory, protection, research and management. The basic classification scheme consists of a letter, denoting at what scale they are considered and a number indicating their status or degree of imperilment.

Scale:
G – globally
N – nationally
S – sub-nationally (state or province)

Status
1 – Critically Imperiled
2 – Imperiled
3 – Vulnerable to Extirpation
4 –Apparently Secure
5 –Demonstrably Widespread, Abundant and Secure

Accordingly, a natural community such as lakeplain oak opening, which is ranked G1/S1, is considered imperiled globally as well as at the state and province scale.

Michigan Natural Features Inventory Element Occurrence Rankings

While any element occurrence – a population of a rare species or remnant natural area - is an asset, not all are of equal ecological value. For an individual species, an element occurrence consists of not just a single plant but rather the fully occupied habitat that contributes to the long term persistence of the species at a particular location. A population that spreads across a large area of high quality habitat, with many individual plants, has a much better chance of long term viability than isolated plants which may persist in the midst of rapidly changing landscapes. For community types, an occurrence represents a defined area that contains a characteristic species composition and structure.

Occurrences are ranked according to their estimated long-term viability:
A – Excellent
B – Good estimated viability
C – Fair estimated viability
D - Poor estimated viability
E – Verified extant (viability not assessed)
H – Historical
F – Failed to find
X – Extirpated

In some cases, letters "A", "B", "C" and "D" may be combined to express a range of estimated viabilities, i.e., AC – excellent to fair. In addition, the "?" qualifier may be used with these four letters to indicate uncertainty[23].

between the different communities of the Great Lakes marsh system (Great Lakes marsh, lakeplain prairie, lakeplain oak openings). Acreage/hectare goals should be based on historical extent and patch size should be determined by the range and mean of historical patch size and/or the minimal dynamic area. Second priority should be given to the remaining natural communities historically found in the study area. Third priority should be placed on improving the integrity of existing natural communities that are in fair to poor condition and maintaining the condition of high quality remnants. This is particularly important for lakeplain prairie, lakeplain oak openings and Great Lakes marsh. Fourth priority should be given to the overall integrity of the landscape. This is probably best addressed by improving the scores of existing potential conservation areas by addressing size, shape and connectivity. Lastly, it is important to address widespread threats. No restoration plan can be truly successful if it doesn't address threats such as water and air pollution, urban expansion, fragmentation and intensive recreational pressure.

There may be circumstances where several of these priorities can be met on the same parcel of land. A matrix could be developed to help determine where these might occur on the landscape and priorities could be based on the cumulative contributions to ecosystem health rather than assessing each site on an individual criterion. Below is a list of criteria to analyze when determining restoration targets:

- Number of existing A-B ranked (viable) occurrences for each natural community type (see left text box for discussion of ranking).
- Size of each natural community occurrence compared to recommended minimum viable sizes
- Percent remaining of original acreage/hectares for each community type
- Percent natural vegetation cover remaining in each subwatershed
- Number of intact Great Lakes marsh complexes (determined by GIS)
- Percentage of Potential Conservation Area acres/hectares with a high quality score
- Percent of riparian zone (Lake St. Clair and all rivers/stream segments within study area) with 100 m buffer of natural vegetation.

As with the target-setting questions listed earlier in this section, many of the answers to these questions can be found throughout this document, particularly with the online abstracts (www.glc.org/habitat/abstracts.html), the Potential Conservation Area Analysis and/or the Integrated Coastal Management tool described in Section VII.

VIII. C. Recomendations

1) Maintain and Restore Adequate Representation of Native Biodiversity

1-a. Protect an adequate number of viable natural community occurrences

i) Protect at least 2 viable examples of each community type.

ii) Protect at least 4 viable examples G1 or G2 ranked communities such as Great Lakes marsh, lakeplain wet-mesic prairie and lakeplain wet-mesic prairie

Tools:

- High Quality Natural Communities (determined by Heritage Programs)
- Unchanged vegetation within high priority Potential Conservation Areas
- Unchanged vegetation within lower priority Potential Conservation Areas
- Minimum viable sizes for community types:
  Great Lakes marsh > 2,500 (1,012 hectare) patch (Environment Canada, 2004)
  Forest types > 500 acre (202 hectare) patch (Environment Canada, 2004)
  Grassland/savannah types > 250 acre (102 hectare) patch (Henslow sparrow reference)
  Other wetland types = no minimum size for viability

1-b. Improve ecological conditions of degraded natural communities

i) Identify unchanged vegetation

ii) Conduct surveys to assess condition of existing remnants

iii) Identify key threats/stresses

iv) Determine desired level of health

v) Develop a management plan

Although patches of various natural community types exist throughout the area, many of these patches are experiencing declining health due to past and present land uses, resource exploitation, pollution, habitat destruction, fragmentation, invasive species, altered hydrology and fire suppression. As a result, many of these natural communities may not be functioning in a state that is capable of self repair and are self sustaining. While spatial (GIS) data can provide a general sense about current land use, land cover and habitat extent and conditions, including identifying potential unchanged land cover and potential conservation areas as was done for this project. However, GIS does not replace on-the-ground surveys and analyses. GIS data and tools should be used in concert with field surveys to assess the actual quality and restoration potential of natural areas. The recommended course of

HIGHLIGHT

The most effective way to assess quality is to conduct on the ground biological surveys.

action is to identify the highest quality patches and maintain those patches through management activities and restoring adjacent lands.

Site selection involves examination of historical or pre-disturbance conditions, degree of alteration, present ecological conditions and other factors[24]. Factors to consider include: soils, water table fluctuations, hydrologic alterations, species assemblages, species richness, exotic plants and animals, roads, seedbank and seed sources.

Tools:

- Unchanged vegetation layer (project data available for Michigan only; no data for Ontario)
- Priority Conservation Area Analysis (see Section VII of this document)
- Surveys by ecological experts
- Floristic quality index
- Index of Biological Integrity
- Marsh Monitoring Program

1-c. Increase acreage/hectares of underrepresented natural communities

i) Increase acreage/hectares of globally rare natural communities (lakeplain prairie, lakeplain oak openings, Great Lakes marsh) to at least 20% of original acreage (or equivalent hectares). Ensure there are at least 4 viable occurrences for each type.

ii) Increase acreage of common natural communities that are currently uncommon in the study area (<20% of historic coverage) to at least 20% of original acreage or equivalent hectares. Ensure there are at least 2 viable occurrences for each type.

Based on the landscape analysis of natural communities in the area, almost all natural communities could be considered rare due to the high degree of modification to the landscape. Lakeplain prairie currently occupies less than 1 percent of its historical extent in Michigan. In the project area, there are only a few small remnants remaining in Michigan, while Walpole Island First Nation still contains several large patches. Lakeplain oak openings, closely related to lakeplain prairies, currently occupy only a few sites in Michigan and Ontario. Moving closer towards the open water, Great Lakes marsh has diminished by 20,000 acres (about 8,094 hectares) in Lake St. Clair since 1878 and the majority of remaining marsh is controlled by dikes and water control structures.

HIGHLIGHT

Any restoration activities in this area should strongly consider all three of these very rare, fragile, nearshore natural communities:

- lakeplain prairie;
- lakeplain oak opening; and
- Great Lakes marsh

Lakeplain prairie, lakeplain oak openings and Great Lakes march are all natural communities considered globally imperiled by The Nature Conservancy. In addition, all three support the vast majority of rare plants and animals found within the Lake St. Clair buffer zone. Any restoration activities in this area should strongly consider all three of these very rare, fragile, nearshore natural communities.

Tools:

- Identify circa 1800 vegetation lost to agriculture and old fields
- Prioritize by proximity to Potential Conservation Areas
- Prioritize by proximity to same unchanged vegetation type – outside of Potential Conservation Areas

1-d. Protect adequate number of viable occurrences for species in greatest need

i) Protect all remaining G1 – G3 (globally rare ranked 1-3) plant and animal occurrences (known as "element occurrences) last observed since 1980. The 91 occurrences of 14 different elements are listed in Table VIIIC – 1 below.

Type	Scientific Name	Common Name	COSEWIC	US	MI	ONT	Global Rank	ONT S Rank	MI S Rank
Plant	Agalinis skinneriana	Skinner's Agalinis	Endangered		E		G3	S1	S1
Plant	Lycopodiella subappressa	Northern Appressed Clubmoss			SC		G2		S2
Plant	Platanthera leucophaea	Prairie Fringed Orchid	Endangered	LT	E		G2	S2	S1
fish	Acipenser fulvescens	Lake Sturgeon	Not at Risk		T	NIAC	G3G4	S3	S2
fish	Ammocrypta pellucida	Eastern Sand Darter	Threatened		T		G3	S2	S1S2
fish	Notropis anogenus	Pugnose Shiner	Endangered		SC	THR	G3	S2	S3
fish	Noturus stigmosus	Northern Madtom	Endangered		E	THR	G3	S1S2	S1
insect	Euphyes dukesi	Duke's Skipper	(null)				G3	S2	
insect	Papaipema beeriana	Blazing Star Borer			SC		G3		S1S2
insect	Papaipema sciata	Culvers Root Borer			SC		G3G4		S2S3
mussel	Epioblasma torulosa rangiana	Northern Riffleshell		LE	E		G2T2		S1
mussel	Epioblasma triquetra	Snuffbox	Endangered		E		G3	S1	S1
mussel	Simpsonaias ambigua	Salamander Mussel			E		G3		S1
mussel	Villosa fabalis	Rayed Bean			E		G1G2		S1

All G1-G3 insects and plants in the Lake St. Clair coastal area are associated with lakeplain prairie. In general, mussel and fish species are both very difficult to protect from a spatial standpoint. A best bet approach is maintaining and establishing buffers along riparian zones, particularly upstream of known populations.

Tools:

Due to the high degree of fragmentation and relatively strict requirements of G1-G3 species found here, all G1-G3 plant and animal occurrences in the study area should be captured using a combination of the coarse filter and landscape integrity approach described throughout this section.

2) Maintain and Restore Landscape Integrity (Supporting Landscape)

2-a. Improve overall ecological integrity of the study area by increasing the size and improving the shape of Potential Conservation Area's.

i) Strive towards 20-60% natural vegetation coverage in each subwatershed (Environmental Law Institute, 2003).

ii) Increase the score of 50% of total Potential Conservation Area acreage or equivalent hectares (not 50% of Potential Conservation Areas) to 15 or higher in Ontario and 19 or higher in Michigan (these represent roughly half of the total possible points respectively. (These numbers differ due to data limitations for Ontario lands).

iii) Increase core size of each Potential Conservation Area to a minimum of 100 acres (40 hectares) with a 300 foot (91 meter) buffer.

2-b. Increase connectivity between Potential Conservation Area's, with a particular emphasis on the Great Lakes marsh system.

i) Establish natural connections among 50% of existing Potential Conservation Area's, using the following guidelines

- 1.2 kilometers (.75 miles) width to provide interior habitat
- 100 – 1,000 m width is considered best
- Strive for shortest distance (least cost)
- Follow riparian corridors
- Focus on Great Lakes marsh transition zone
- Utilize areas with existing natural lands

ii) Restore at least two areas of barrier free connectivity between Great Lakes marsh, lakeplain prairie and lakeplain oak opening (Great Lakes marsh system)

iii) Establish 100 m buffers along 75% of all riparian zones (Environment Canada, 2004).

Due to the high degree of fragmentation and landscape modification, there is a critical need for improving the connectivity of fragmented ecosystems and landscapes in the project area. This is particularly true for all of the components of the Great Lakes marsh ecosystem from the submergent zone to the shrub-carr zone throughout its historical aerial extent on the landscape, including the various lakeplain prairie types as well as lakeplain oak openings. As mentioned earlier, the lateral movement of the marsh complex inland during high water periods and lakeward during low water periods is critical to the long term health of the system. The development of roads, dikes, structures, channels and seawalls creates a "pinching effect" on the marsh and decreases its ability to regenerate after disturbance (resiliency).

HIGHLIGHT

There is a critical need for improving the connectivity of fragmented ecosystems and landscapes.

FACT

Connectivity should also include hydrologic connectivity – the natural movement of water throughout the system.

Increased connectivity with the Great Lakes marsh system leads to larger wetlands and habitat diversity which improves waterfowl productivity, provides larger staging areas during migration, and increases overall biological diversity. Connectivity should also include hydrologic connectivity – the natural movement of water throughout the system. This natural movement of water provides oxygen to help breakdown dead organic matter allows for movement of aquatic organisms such as fish and allows for the natural development of new environments. Restoration efforts should really focus on the reintegration of the entire Great Lakes marsh complex where possible in order to improve ecological integrity at the landscape scale.

Tools:

Potential Conservation Area data layer *(see Section VII)*
Integrated Coastal Management Tool *(See Section VII)*

3) Manage Widespread Threats/Stressors

3-a. Maintain and restore a high degree of both surface and ground water quality.

i) Provide buffers along all rivers and streams (>100 meters; 328 feet)
ii) Restore wetlands (minimum 10% of original acreage or equivalent hectares)
iii) Restore upland buffers around all wetlands (>300 meters; 984 feet)
iv) Protect vulnerable wellhead protection areas (if defined)
v) Protect shallow aquifer recharge areas (if defined)
vi) Protect headwaters of rivers and streams

No restoration plan can be truly successful if it does note address threats. A group can plant thousands of bulrush plugs, but if they do not address threats to the site they are restoring such as boat activity, water pollution, or beach grooming, their efforts will be fruitless. Many threats can and should be addressed at the site level. However, some threats seem to occur throughout the landscape. These are stressors that will continue to defeat the best restoration efforts if they are not treated at a larger scale. Examples of Hwidespread threats include: urban development, invasive species, altered hydrology, water pollution (point and non-point), air pollution, recreational boating and shipping. Section V of this document discusses these stressors in depth and identifies existing programs to address them.

HIGHLIGHT

The Potential Conservation Areas that were identified within the project area and ranked as part of this Assessment in Section VII provide an ideal starting point.

Application of GIS tools holds particular promise to help address threats posed by non-point source water pollution. The Integrated Coastal Management tool discussed in Section VII of this document can be used to identify particular habitat types (e.g., riparian) within the Lake St. Clair study area that are especially vulnerable (e.g., with little or no vegetative cover) to pollution threats and help prioritize areas for remedial action, such as revegetation.

Tools:

- Lake St. Clair Integrated Coastal Management (ICM) Tool *(See Section VII)*
- Hydrology GIS layer
- Circa 1800 vegetation GIS layer
- Wetlands GIS layer
- Wellhead locations
- Sensitive groundwater recharge area GIS layer

4) Assess Current Management and Status

When conceptual concerns have been adequately addressed, it is critical to identify the current management and protection status of the lands that have been targeted for protection and/or restoration. Are they privately held and ripe for development? Might the owner consider a conservation easement to preserve them in their natural state? Are they already owned by the state or a local municipality? The Potential Conservation Areas (PCAs) that were identified within the project area and ranked as part of this Assessment in Section VII provide an ideal starting point. These lands may be protected by a number of mechanisms: as designated natural areas, proposed natural areas, through state ownership, county ownership, township ownership, city/town ownership, conservation easements, farm bill program enrollment, local natural features ordinances, etc. These and other existing land management programs that may already offer some level of protection to natural lands are described in detail in Section VI of this Assessment.

HIGHLIGHT

Widespread threats include: urban development, invasive species, altered hydrology, water pollution, air pollution, recreational boating and shipping.

Each area that is not currently protected should be identified and evaluated to determine the mechanism that would protect it most effectively. In terms of priority, not all natural features are created equally. Some areas may not be suitable for inclusion in the pool of potential conservation lands due to incompatible adjacent land uses, high financial cost, contamination, etc.

Important questions to consider include:

- Who owns the lands?
- Who should own the land to protect it in perpetuity?
- What resources are available to protect or restore the land?
- Who will spearhead a particular purchase/protection/restoration effort?
- Who will "sell" the vision so that it is actually implemented?

Conclusion

The purpose of this chapter is to provide a framework for determining how to best conserve and restore natural habitats and biodiversity within the Lake St. Clair coastal area. In a highly fragmented landscape, determining and prioritizing conservation targets can sometimes be a very simple exercise, particularly if the scientific information is accurate, current and comprehensive. However, if the goal is to go beyond protecting the small remaining fragments and instead ensure the long term viability of existing biota and possibly even reestablish plant and animal species and ecological processes that have long disappeared from this landscape, the process can be rather complicated. To simplify this process, the recommendations developed for this project focus on three primary areas: 1) maintain and restore adequate representation of native biodiversity, 2) maintain and restore landscape integrity (the supporting landscape) and 3)

manage widespread threats and stresses. This section provides a conceptual framework for setting goals, objectives and targets. Specific actions under each recommendation provide a reasonable starting point for making sometimes difficult conservation planning decisions, which can be tailored to each community within the project area.

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